

REMARKS

Claim 4 has been canceled. Claims 1-3, 5 and 30-44 are active in the case. Claims 6-29 stand withdrawn from consideration.

The present invention relates to an activated carbon which is in the form of a granular isotropic pitch.

Claim Amendments

Claim 1 has been amended by placing the limitation of Claim 4 therein. Claim 4 has been canceled. Entry of the amendment into the record is respectfully requested.

Invention

The present invention is directed to an activated carbon which is prepared from a granular isotropic pitch. An important requirement of the claim is that in the preparation of the granular isotropic pitch, an intermediate step of spinning the pitch into a fiber prior to granulation must not be employed as is known to be done. The activated carbon of the present invention, which has a total amount of surface functional groups of 2.5 meq/g or less and when employed as an electrode in a large electrostatic capacitance device, provides for significant electrostatic capacitance and only undergoes small expansion when in a capacitor.

Prior Art Rejection

In the parent application Claims 1-3, 30, 32, 36 and 38 have been rejected based on 35 U.S.C. § 102(b) as anticipated by Takahashi et al., JP 11-293527.

As stated on the record previously, the '527 reference discloses an optically isotropic pitch-based activated carbon fiber which is capable of providing excellent characteristics as an electrode material in an electric double layer capacitor. The electrode is prepared specifically by **grinding an activated carbon fiber** after infusibilization, to a finely divided particulate material which is then used to form the electrode for an electric double layer capacitor. The reference requires the preparation of an activated carbon fiber and then pulverization of the activated, infused fibers into pieces having a average particle diameter of 5-50  $\mu\text{m}$ . Activation of the pieces of fiber occurs by treatment with alkali. However, in order to maintain the spinnability of an optically isotropic pitch fiber, it is necessary to suppress the generation of overpolymerized materials or volatile substances. This is necessary because these materials or volatile substances result in a diminishing of the spinnability of the optically isotropic pitch as a raw material for the activated carbon. Alternatively, it is necessary to control the softening point of the pitch precisely. It is also necessary to maintain the strength required for the step of winding the fiber into a nonwoven fabric, which step follows the spinning step.

In order to prepare an activated carbon for polarizable electrodes of an electric double layer capacity, as disclosed in the publication, it is important to produce stably **spinnable** optically isotropic pitch, which makes it possible to avoid the problems mentioned above. Moreover, it is essential in the spinning of the pitch to provide stable conditions during which the spinning occurs and during the step of making the pitch into a fiber. Thus, complicated processing is necessary with the technique of the reference. This leads to increased production costs which makes the process expensive. Still further, the fiber has an

anisotropic shape and it also has an orientation when it is spun, so that reactivities of the major axis and the short axis of the fiber are different from each other. Consequently, at the time of infusibilizing the fiber, the amount of oxygen introduced from the surface of the fiber along the short axis direction of the fiber may be different for the amount of oxygen introduced along the major axis of the fiber. The fiber-activated degrees, such as structural changes, when the fiber is activated may be different in the short axis direction of the fiber as opposed to the major axis direction of the fiber. This means that the fiber may exhibit poor workability because of its anisotropic shape.

Contrary to the method of the '527 reference for preparing activated carbon, in the present invention a method is employed which starts with an appropriate pitch material to form the granular isotropic pitch of the invention. It is most important to note that the process employed does not include a fiber forming step. Claim 1 emphasizes this important point that in the process of preparing the present activated carbon from granular isotropic pitch, the pitch is not spun into a fiber at some point in the process.

Another aspect of the claimed activated carbon is that it must contain a total amount of surface functional groups of 2.5 meq/g or less. As stated on page 10 of the present specification, if the total amount of functional groups on the surface of the activated carbon is more than 2.5 meq/g, the endurance of the product capacitor may drop. On the other hand, the Takashi et al reference, which has been cited and applied against the present claims, does not show or suggest an activated carbon that has a total amount of functional groups on its surface. Accordingly, the activated carbon of the present invention is neither shown nor suggested by Takashi et al.

As to the polarizable electrode of the invention claimed in Claim 30, it is clear that the '527 reference does not show a polarizable electrode which is prepared by mixing the activated carbon of the present invention with at least a binder and an electroconductive filler. Because the activated carbon of the present invention is not the same as the activated carbon material of the polarizable electrode of the reference, as is evident from the discussion above, the presently claimed polarizable electrode stands separate and distinct from that of the reference. Further, the electric double layer capacitors of Claims 36 and 38 are distinguished over the electric double layer capacitor of the reference on the basis that the polarizable electrodes incorporated therein are based on the novel activated carbon of the present invention. Accordingly, withdrawal of the rejection of the claim over Takashi et al is respectfully requested.

As to the rejection of Claims 4, 5, 33, 35, 39 and 4, all of these claims are dependent claims which depend upon generic claims not anticipated by or rendered obvious over Takashi et al. Accordingly, since the dependent claims depend upon independent claims which are patentably distinguished over the reference, these claims in turn are believed patentably distinguished by virtue of their dependency. Moreover, as pointed out above, the functional group content of the present activated carbon must be set to 2.5 meq/g or less, otherwise the endurance of the capacitor containing electrodes based on the activated carbon of the invention likely will drop. Further, a desirable aspect of the activated carbon of the present invention is that it only undergoes a small expansion when placed in a capacitor as an electrode. The present activated carbon has this desirable property and is distinguished over the activated carbon of the reference on the basis of its different method of preparation which

does not involve a step in which a pitch material is spun into fibers or filaments, which fiber spinning process, as noted above, results in anisotropic shape of the fiber and an orientation of the fiber such that the reactivities of the major axis and the short axis of the fiber are different from each other. Accordingly, the expansion of the activated carbon of the present invention is different from that of the fiber derived intermediate of the reference. Withdrawal of the rejection is

Claims 31, 34, 37 and 40 are dependent claims which are ultimately dependent upon the activated carbon of the present invention from which polarizable electrodes for use in electric double layer capacitors are formed. Because the activated carbon of the present invention is clearly distinguished over the activated carbon of the reference which is used to prepare electrodes for an electric double layer capacitor, it is submitted that the dependent claims are distinguished, not only over Takashi et al., but also the secondary JP '006 publication, which does not show or suggest the activated carbon of the present invention from which polarizable electrodes are prepared. Accordingly, withdrawal of the prior art ground of rejection based on the cited combination of claims is respectfully requested.

Appln. No. 09/911,483  
Preliminary Amendment

It is now believed that the application is in proper condition for consideration on its merits.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,  
MAIER & NEUSTADT, P.C.



Norman F. Oblon  
Attorney of Record  
Registration No. 24,618

Frederick D. Vastine, Ph.D.  
Registration No. 27,013

Customer Number

**22850**

(703) 413-3000  
Fax #: (703) 413-2220  
NFO/FDV